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dustries and trades of productive, technical and constructive industry.

It is stated that Dr. Francis Walker has accepted a call to the department of political and social science in Colorado College.

THE University of Pennsylvania extends the right of naming one of the houses in the new dormitory to all contributors of \$10,000 or more to the building fund. The following are the names of the contributors up to the present date: Charles C. Harrison, Alfred C. Harrison, Thomas F. Dolan, Robert E. Foerderer, William M. Singerly, Hugh Craig, Jr., Alice D. Craig, Hatfield, Burnham, Williams & Co., the Misses Blanchard, Thomas McKean, E. H. Fitler, J. E. Bayard, Richard F. Loper and William W. Frazier.

CORRESPONDENCE.

ABORIGINAL SANDALS.

DEAR SCIENCE: In attempting to comprehend the practical part of drawings, etchings, carvings and sculptures in the mountain region of America from Mexico southward, I have often tried to get some information of the footwear. Any one who will look through the drawings of 'Kingsborough' will notice that the sandals on the feet of the different figures have soles and heelstraps looking almost like the quarters of a modern shoe or the heel of a Peruvian soldier's sandal, and that in some way a lacing passes around in front of the ankle on top of the foot. There is no intimation of a string or strap passing up between the toes as in the modern rawhide sandal, which may be seen by the thousands on the feet of peons in Latin America all the way from Arizona and New Mexico to the limits of Peru.

Wiener, in his work entitled 'Perou et Bolivie,' figures a great many styles of these modern sandals which are, in form, allied to the thousand-and-one varieties in use anywhere about the Mediterranean, and

awakens a suspicion that the sandal with a single string passing between the great toe and the second toe is of Eurafrian origin.

In plate (3) of 'Stone Sculptures of Copan and Quirigua, with drawings by H. Meye and text by Julius Schmidt, published in New York in 1883 by Dodd & Mead,' there will be seen on the foot of the Monolith a sandal in which a string passes between the first and the second toe and the third and the fourth toe, forming a loop which is attached by means of a knot to an ornamental bandage encircling the ankle, and it is to this sculpture that I wish to draw special attention.

Those of my readers who were so fortunate as to visit the Cliff-dweller collections at the Columbian Exposition may recall the styles of sandals there exhibited; if not, they will please turn to 'Nordenskjöld's' illustrated work on the Cliff-dwellers' collections, made by him, and examine plate (46). There two styles of sandals are figured, not very distinctly, but the characteristics can be made out.

I am indebted, however, to Mr. Stewart Culin, of Philadelphia, for the privilege of examining carefully four examples of Cliff-dwellers' sandals in possession of the Museum of the University of Pennsylvania. In three of these there is either a loop or a provision for a loop, which passes between the first and the second toe and the third and the fourth, enclosing the second and third toe. In the fourth sandal a series of loops around the margin of the sole serve to receive the lacing which passes backward and forward, across the foot diagonally through one and then another, using up the whole series. These four sandals will now be more carefully described. In one of them the binding string or lacing commences at the instep and passes in a bend around the toeloop, and by another bend around the right side of the heel-

cord, and by another bend around the left side of the heelcord and back to the starting point, where it is fastened off by a series of half-hitches. The heelcord is a twine woven into the margin of the sole on either side of the heel. This, according to Mr. Cushing, is called by the Zúñi *Égati* (heel-skin-under-grass). The sole is made of split *Yucca angustifolium* fibre plaited in the diagonal form of weaving common in the Pueblo country, each stitch passing over two and under two.

A second pair, having the eyelets worked in for the toeloop, is built upon a warp of twenty-three filaments or small bundles of shredded *Yucca* fibre. The weft is doubled, the upper portion consisting of a close weaving exactly like that on the Pueblo blankets and belts, the yarn being twisted bast fibre (probably *Apocynum*). The lower part of the sole consists of a series of rows or twined weaving laid under and enclosed in the warp of the upper weaving, but not appearing on the upper side. The exact technique of this under weaving has not been made out, owing to the danger of mutilating the specimen, but it seems to be in a line with the composite texture noticed in the Yoki baskets which I have described elsewhere. This sandal, when new, was prettily decorated with bands and stripes of red and black threads, alternating with the natural color of the material. At the heel and toe the warp threads are braided down and enclosed in an ornamental border of plaited buckskin thong. The toestrap is missing and the heelstrap is a small rope of bast fibre. One end firmly secured, the other slips through a loop on the back and is used as a part of the lacing.

The third specimen is built up upon four warp ropes of shredded *Yucca* fibre; the weft being of short pieces of very loosely twisted yarn of *Yucca* fibre woven into the warp by the same style of weaving as in the last named, such as is seen on the blankets and

the Moki wicker trays and in the ordinary twilled goods. These short warp strands are so manipulated that the frayed ends shall be spread out on the top of the sandal. The four-stranded warp, the plan of weaving and the shredding of the ends, are precisely like the texture of many hundreds of Japanese and Corean sandals, only in this specimen the shredding forms the top of the sandal, while in the Japanese example of straw the shredding forms the bottom. The loop for the toes in this specimen is well shown, consisting of a bit of four-ply rope of the *Agave* fibre, loosely twisted. The lacing is gone.

The fourth example is a very coarse sole of split *Yucca* fibre plaited diagonally and plainly with loops of the same material around the margin for the lacing, and on top between the sole and the lacing is laid a pad or bed of neatly folded corn husks to act as a protection to the sole of the foot.

In the National Museum is a sandal woven in the same manner as the one last described, having a loop to enclose the second and the third toe. This specimen was dug from the celebrated mound in Saint Georges, Utah, by Edward Palmer.

If one will examine a collection of photographs showing the peon and common people of Mexico and other Latin American states by the Rev. F. H. Cleveland, he will notice that many are wearing sandals having no string between the toes whatever.

In the sculpture from 'Copan' and the mound at Saint Georges, we have the two ends of a geographic era in which the sandal has a loop in front enclosing two toes.

The questions raised by these specimens are as follows: Was the old aboriginal Mexican sandal provided with a loop to enclose the second and the third toe? Is the form of rawhide sandal, now so common in Latin America, having a single string between the first and the second toe, a derivative from the Old World?

The sandal with the loops around the edges may be compared with a specimen figured in 'Wiener's Peru,' made of hide fitted around the foot and slashed around the border to receive the lacing.

It may be also compared with sandals of vegetal material in collections from northern Japan and the Aino country.

Yours truly, O. T. MASON.

U. S. NATIONAL MUSEUM.

THE PIGNUTS.

THERE is some question as to the exact distribution of the common Pignut (*Carya porcina* or *Hicoria glabra*) and the related *Carya* or *Hicoria microcarpa*, and the undersigned will be grateful for herbarium specimens, and especially nuts with their husks, representing both. In the recently published seventh volume of Professor Sargent's *Silva*, the range of *glabra* is given as southern Maine to southern Ontario, through southern Michigan to southeastern Nebraska, southward to the shores of the Indian River and Peace Creek in Florida, and to southern Alabama and Mississippi, through Missouri and Arkansas to eastern Kansas and the Indian Territory, and to the valley of the Nueces River in Texas. *H. microcarpa* (treated in the *Silva* as a variety of *glabra*, under the varietal name *odorata*) is said to occur in eastern Massachusetts, Connecticut, eastern and central New York, eastern Pennsylvania, Delaware, the District of Columbia, central Michigan, southern Indiana and Illinois, and Missouri.

WILLIAM TRELEASE.

St. Louis, Mo.

SCIENTIFIC LITERATURE.

A Students' Text-book of Botany: By SIDNEY H. VINES, Sherardian Professor of Botany in the University of Oxford. First half pp. x., 1-430, Fig. 279. 1894. Second half pp. xvi., 431-821. 1895. London, Swan, Sonnenschein & Co. New York, Macmillan & Co. 8vo.

The completion of this, the best general text-book of botanical science yet published in any language, and just now the only adequate presentation in compact form of the subject-matter within its scope, is an event of more than ordinary interest in the annals of book-making. It is not too much to say that in this work Dr. Vines has surpassed even the high expectations of his friends. The volumes in hand have all the admirable literary quality and firm grasp of recent research that characterized so notably the *Lectures on the Physiology of Plants* by the same author, which appeared in 1886 and immediately took its place among the leading authoritative manuals in its line. The later work gains, perhaps, over the earlier in its somewhat more concise and transparent style and in its more perfect subjection of the material to the logical classification adopted at the outset. Certainly nothing could be better than the chapters on the general morphology of the members, on the tissues and on the general physiology. It is a great gain to botanical teaching in England and America to have the modern point of view in anatomy and physiology thus brought forward without the confusion and archaisms that diminished in a degree the availability of older texts in common use.

In general, it should be said that the perspective of the work is most admirable. About the right relative amount of space is given to each of the four principal subdivisions—Morphology, Anatomy, Taxonomy (here called *anglicé*, the 'Classification of plants') and Physiology. As has been pointed out by previous reviewers, it might seem that the third division has been somewhat unduly extended at the expense of the fourth. Doubtless this is a natural result of Dr. Vines having specialized in physiology, for under such conditions he would possibly desire to err rather on the side of understating than of overstating the prom-